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TRW Automotive
Occupant Safety Systems

NHTSA - 00-7013-40
ASW 8/15/00

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DEPT. OF TRANSPORTATION
PROJECTS

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TRW

June 5, 2000

Ms. Rebecca MacPherson
Mr. Edward Glancy
Office of Chief Counsel, NHTSA
NCC-20, Room 5219
400 7th St. S.W.
Washington, D.C. 20590

Dear Ms. MacPherson and Mr. Glancy:

In review of the recently issued Interim Final Rule, Docket No. 00-7013; Notice 1, TRW finds the new instructions for the positioning of the child dummies incomplete and seemingly contrary to the intent put forth in the SNPRM. TRW is herein requesting a review of our observations and clarifications to the subject instructions. To assist in this review, we have reiterated some of the lines from the sections, below, as printed in the document and then stated our observations and questions in italics.

S22.4 Low Risk Deployment Tests – 3 year old dummy

S24.4 Low Risk Deployment Tests – 6 year old dummy

Section XIII - Miscellaneous Issues, Sub Section G

3 Year Old Dummy

S22.4 Low risk deployment tests.

S22.4.1.2 Locate the vertical plane parallel to the vehicle longitudinal centerline through the geometric center of the right front air bag tear seam. This is referred to as "Plane D."

Q 1: How is the geometric center of the passenger air bag tear seam defined? The sketch in Figure 1 shows how TRW defined the geometric center of one passenger bag tear seam.

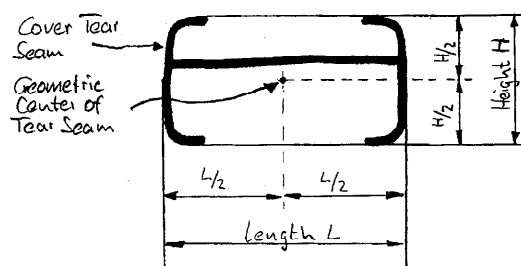


FIGURE 1



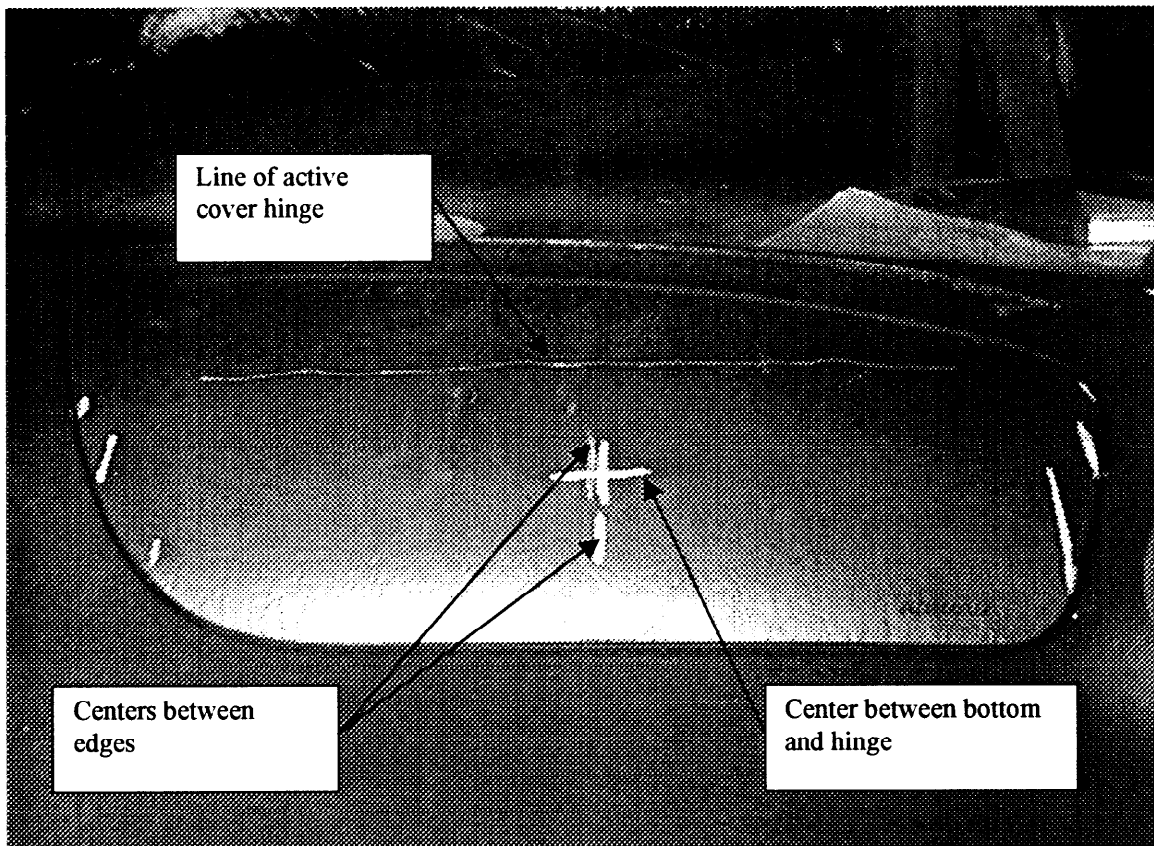


FIGURE 2

It is TRW's experience that many passenger systems don't have a true tear seam. These modules have a cover that opens as part of the I/P. The opening or active portion is not always symmetrical – making determination of the geometric center somewhat difficult. Some covers have an active hinge within the overall area of the cover. The photograph in Figure 2 shows one such cover and how TRW interpreted the requirement. Is this the intent of the final rule? To find the geometric center of the ACTIVE portion of the cover (the part that actually opens)?

S22.4.1.3 Locate the horizontal plane through the geometric center of the right front air bag tear seam. This is referred to as "Plane C."

Q 2: Is it NHTSA's intent that the horizontal plane be defined from the geometric center of the area through which the bag will deploy, or the center of the entire cover. The center of the area in figure 1 is fairly straight forward, but the use of the phrase "tear seam" (pattern) does not adequately describe the cover in figure 2. In figure 2, TRW would locate plane C between the active hinge and the lower edge of the active cover. Is this the intent of the final rule?

S22.4.2 Position 1 (chest on instrument panel). 3YO

S22.4.2.1 There are no seat track, seat height, or seat back angle requirements.

S22.4.2.2 Place the dummy's midsagittal plane coincident with Plane D.

S22.4.2.3 Initially position the thighs at a right angle to the spine and the legs at a right angle to the thighs. These angles may be adjusted to the extent necessary for the head and torso to attain their final positions.

S22.4.2.4 With the dummy's thorax instrument cavity rear face vertical and Point 1 in Plane C, move the dummy forward until Point 1 contacts the instrument panel. If the dummy's head contacts the windshield and keeps Point 1 from contacting the instrument panel, lower the dummy until there is no more than 5 mm (0.2 in) clearance between the head and the windshield.

Q 3: TRW positioned a 3 yr old into position 1 according to the SNPRM (Figures 3 & 4) and to the final rule (Figures 5 & 6). For the final rule positioning - after Point 1 of the dummy is located in planes C and D, the dummy is translated forward until the head first contacts the windshield, the dummy must then be lowered to gain the 5 mm clearance. According to the final rule description, the position is complete after lowering the dummy for head clearance. But in cars with more severe windshield angles, and/or top mounted air bags, when the head contacts the windshield, the dummy chest will probably sit far away from the instrument panel. In the example below, the distance between dummy chest and the I/P will be 110 mm when positioned according to Final Rule, compared to 0 mm when positioned according to the SNPRM. Is this the intent of the final rule?

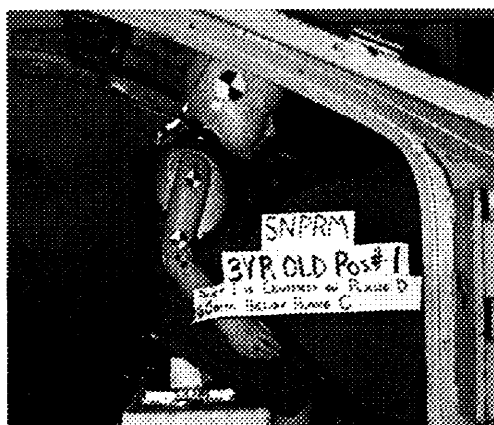


FIGURE 3

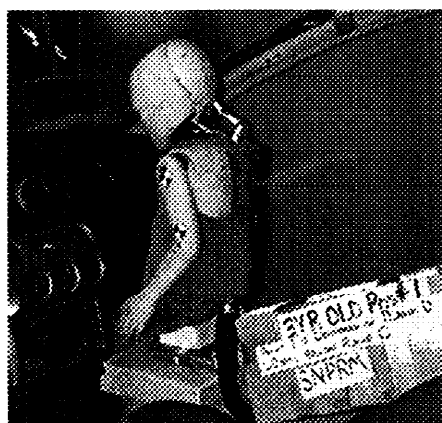


FIGURE 4



FIGURE 5

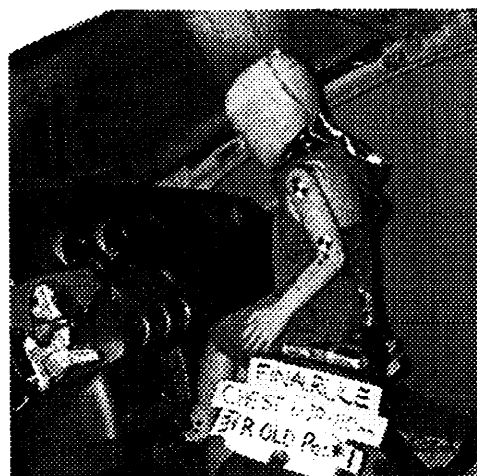


FIGURE 6

S22.4.3 Position 2 (head on instrument panel). 3 YO

S22.4.3.1 Place the passenger seat in the full rearward seating position. Place the seat back in the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3. If adjustable in the vertical direction, place the seat in the mid-height position.

S22.4.3.2 Place the dummy in the front passenger seat such that:

S22.4.3.2.1 The dummy's midsagittal plane is coincident with Plane D. With the thighs on the seat, initially set the thighs perpendicular to the torso and the legs perpendicular to the thighs. Position the upper arms parallel to the torso and rotate the lower arms forward (at the elbow) sufficiently to prevent contact with or support from the seat.

S22.4.3.2.2 The dummy is positioned in the seat such that the legs rest against the front of the seat and such that the dummy's thorax instrument cavity rear face is vertical. If it is not possible to position the dummy with the legs in the prescribed position, rotate the legs forward until the dummy is resting on the seat with the feet positioned flat on the floorboard.

S22.4.3.3 Move the seat forward, while maintaining the thorax instrument cavity rear face orientation until any part of the dummy contacts the vehicle's instrument panel.

S22.4.3.4 If contact has not been made with the vehicle's instrument panel at the full forward seating position of the seat, slide the dummy forward on the seat 190 mm (7.5 in) or until contact is made, whichever is first. Maintain the thorax instrument cavity rear face vertical orientation.

S22.4.3.5 **If contact has not been made**, apply a force towards the front of the vehicle on the spine of the dummy between the shoulder joints until the head or torso comes into contact with the vehicle's instrument panel.

Q 4: The final rule says, that we have to rotate the dummy torso forward only "if contact has not been made" in sections S22.4.3.3 and S22.4.3.4. If contact has been made (which will probably happen in most vehicles), the dummy torso must remain in a vertical position according to section S22.4.3.4. TRW believes it was the intent of section S22.4.3.5 of the final rule to say "Once contact is made" (like in the SNPRM). This way, once any contact is made in either section S22.4.3.3 or S22.4.3.4, then the upper torso would be rotated according to the description in section S22.4.3.5 and the head would be positioned near the instrument panel.

6 Year Old Dummy

S24.4 Low risk deployment tests.

S24.4.1 Each vehicle that is certified as complying with S23.4 shall meet the following test requirements with the 49 CFR Part 572 Subpart N 6-year-old child dummy in both of the following positions: Position 1 (S24.4.2) or Position 2 (S24.4.3).

S24.4.1.1 Locate and mark the center point of the dummy's rib cage or sternum plate (the vertical mid-point of the frontal chest plate of the dummy on the midsagittal plane). This is referred to as "Point 1."

S24.4.1.2 Locate the vertical plane parallel to the vehicle longitudinal centerline through the geometric center of the right front air bag tear seam. This is referred to as "Plane D."

Q 5: Same as Q 1 in S22.4.1.2. How is the geometric center of the passenger air bag tear seam defined? The sketch in Figure 1 shows how TRW defined the geometric

center of one passenger bag tear seam. It is TRW's experience that many passenger systems don't have a true tear seam. These modules have a cover that opens as part of the I/P. The opening or active portion is not always symmetrical – making determination of the geometric center somewhat difficult. Some covers have an active hinge within the overall area of the cover. The photograph in Figure 2 shows one such cover and how TRW interpreted the requirement. Is this the intent of the final rule? To find the geometric center of the ACTIVE portion of the cover (the part that actually opens)?

S24.4.1.3 Locate the horizontal plane through the geometric center of the right front air bag tear seam. This is referred to as "Plane C."

Q 6: Same as Q 2 in S22.4.1.2. : Is it NHTSA's intent that the horizontal plane be defined from the geometric center of the area through which the bag will deploy, or the center of the entire cover. The center of the area in figure 1 is fairly straight forward, but the use of the phrase "tear seam" (pattern) does not adequately describe the cover in figure 2. In figure 2, TRW would locate plane C between the active hinge and the lower edge of the active cover. Is this the intent of the final rule?

S24.4.2 Position 1 (chest on instrument panel). 6 YO

S24.4.2.1 There are no seat track, seat height, or seat back angle requirements.

S24.4.2.2 Remove the legs of the dummy at the pelvic interface.

S24.4.2.3 Place the dummy's midsagittal plane coincident with Plane D.

S24.4.2.4 With the dummy's thorax instrument cavity rear face 6 degrees forward of the vertical and Point 1 in Plane C, move the dummy forward until Point 1 contacts the instrument panel. If the dummy's head contacts the windshield and keeps Point 1 from contacting the instrument panel, lower the dummy until there is no more than 5 mm (0.2 in) clearance between the head and the windshield.

Q 7: Same question as Q 3 in S22.4.2.4. In the example below, the distance between the dummy chest and the center of the module cover will be 290 mm when positioned according to Final Rule, compared to 0 mm when positioned according to the SNPRM. The difference can be seen in Figures 7 & 8. Is this the intent of the final rule?



FIGURE 7 - 6YO Position 1 acc. Final Rule

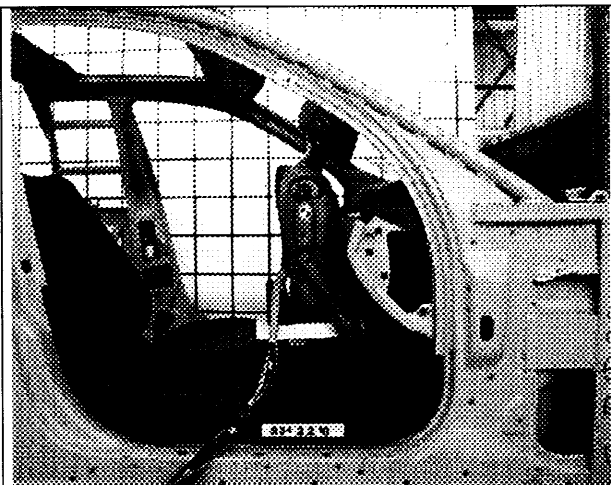


FIGURE 8 - 6YO Position 1 acc. SNPRM

S24.4.2.5 Position the upper arms parallel to the spine and rotate the lower arms forward (at the elbow joint) sufficiently to prevent contact with or support from the seat.

S24.4.2.6 Use the seat adjustments (fore-aft, height) to keep the dummy in position. If necessary, thread with a maximum breaking strength of 311 N (70 lb) and spacer blocks may be used to support the dummy in position. The thread should support the torso rather than the head. Support the dummy so that there is minimum interference with the full rotational and translational freedom for the upper torso of the dummy and the thread does not interfere with the air bag.

S24.4.3 Position 2 (head on instrument panel). 6 YO

S24.4.3.1 Place the passenger seat in the full rearward seating position. Place the seat back in the nominal design position for a 50th percentile adult male (S8.1.3) as specified by the vehicle manufacturer. If adjustable in the vertical direction, place the seat in the mid-height position.

S24.4.3.2 Place the dummy in the front passenger seat such that:

S24.4.3.2.1 The dummy's midsagittal plane is coincident with Plane D. With the thighs on the seat, initially set the thighs perpendicular to the torso and the legs perpendicular to the thighs. Position the upper arms parallel to the torso and rotate the lower arms forward (at the elbow) sufficiently to prevent contact with or support from the seat.

S24.4.3.2.2 The dummy is positioned in the seat such that the legs rest against the front of the seat and such that the dummy's thorax instrument cavity rear face is 6 degrees forward of vertical. If it is not possible to position the dummy with the legs in the prescribed position, rotate the legs forward until the dummy is resting on the seat with the feet positioned flat on the floorboard.

S24.4.3.3 Move the seat forward, while maintaining the thorax instrument cavity rear face orientation until any part of the dummy contacts the vehicle's instrument panel.

S24.4.3.4 If contact has not been made with the vehicle's instrument panel at the full forward seating position of the seat, slide the dummy forward on the seat 190 mm (7.5 in) or until contact is made, whichever is first. Maintain the thorax instrument cavity rear face orientation.

S24.4.3.5 **If contact has not been made**, apply a force towards the front of the vehicle on the spine of the dummy between the shoulder joints until the head or torso comes into contact with the vehicle's instrument panel.

*Q 8: Same as Q 5 in S22.4.3.5. The final rule says, that we have to rotate the dummy torso forward only **"if contact has not been made"** in sections S24.4.3.3 and S22.4.3.4. If contact has been made (which will probably happen in most vehicles), the dummy torso must remain in a vertical position according to section S24.4.3.4. TRW believes it was the intent of section S24.4.3.5 of the final rule to say **"Once contact is made"** (like in the SNPRM). This way, once any contact is made in either section S24.4.3.3 or S24.4.3.4, then the upper torso would be rotated according to the description in section S24.4.3.5 and the head would be positioned near the instrument panel.*

5th Percentile Adult Female Dummy

S26.3 Driver Position 2 (chin on rim)

S26.3.1 There are no seat track, seat height, or seat back angle requirements.

S26.3.2 Adjust the steering controls so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If there is no setting at the geometric center, position it one setting lower than the geometric center. Set the rotation of the steering wheel so that the vehicle wheels are pointed straight ahead.

S26.3.3 Locate the vertical plane parallel to the vehicle longitudinal axis which passes through the geometric center of the driver air bag tear seam. This is referred to as "Plane E."

S26.3.4 Place the dummy in a seated position with its midsagittal plane coincident with Plane E.

S26.3.5 Initially position the legs at a 90-degree angle to the thighs. The legs may be adjusted if necessary to achieve the final head position.

S26.3.6 Position the dummy's thorax instrument cavity rear face 6 degrees forward (toward the front of the vehicle) of the steering wheel angle (i.e., if the steering wheel angle is 25 degrees from vertical, the thorax instrument cavity rear face angle is 31 degrees).

S26.3.7 Position the dummy so that the center of the chin is in contact with the uppermost portion of the rim of the steering wheel. Do not hook the chin over the top of the rim of the steering wheel. Position the chin to rest on the upper edge of the rim, without loading the neck. If the dummy's head contacts the vehicle windshield or upper interior before the prescribed position can be obtained, lower the dummy until there is no more than 5 mm (0.2 in) clearance between the vehicle's windshield or upper interior, as applicable.

Q 9: Does the dummy's thorax instrument cavity rear face angle have to be maintained?

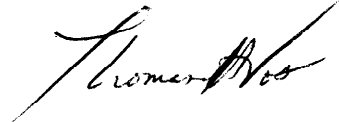
Q 10: Do we have to approach the rim with the chin on a horizontal plane or do we have to lower the head parallel to and along the windscreen until the chin touches the steering wheel.

Section XIII - Miscellaneous Issues, Sub Section G

Q 11: Under Section XIII. Miscellaneous Issues, Sub Section G. Time Periods for Measuring Injury Criteria During Tests. The final rule says "Consequently, the parameters for truncating data for the low risk deployment tests have been changed to the same used for the barrier tests, i.e., 300 ms after the air bag deploys." Is this data collection to be truncated (As DaimlerChrysler suggested) "at 300ms or when the dummy ceases to be in contact with the air bag, whichever occurs first"? This method would include all interaction with the dummy and the deploying air bag, but exclude subsequent interactions with other vehicle interior components. It is TRW's impression from the NHTSA's description of set-up conditions for position 1 in section 2S22.4.2, and section S26.3.1 that say "There are no seat track, seat height, or seat back angle requirements", that post airbag interaction contacts should not be considered. Is this the appropriate interpretation of the final rule?

The phase-in schedule has placed considerable pressure on the industry to demonstrate compliance capabilities of these advanced restraints systems. TRW would appreciate your prompt consideration of its request for clarification of these important details. Please send your response to me.

Respectfully,

A handwritten signature in black ink, appearing to read "Thomas H. Vos", written in a cursive style.

Thomas H. Vos
Director, Safety Systems Technology
TRW - OSS
4505 W. 26 Mile Rd.
Washington, MI 48094

cc: Clarke Harper
Ed Jettner
Kevin McMahon
Peter Levine